

WHAT IS CLAIMED IS:

1. An image pickup device provided with a color
filter array composed of color filters arranged in the
horizontal and vertical directions and an image pickup
element for picking up the image of an object through
said color filter array:
wherein said color filter array comprises color
filter groups of plural units in which each unit
comprises first to eighth color filter groups and each
color filter group representing a column comprises an
array of said color filters;
the first color filter group comprising an
alternate array of first and second color filters;
the second color filter group comprising an
alternate array of third and fourth color filters;
the third color filter group comprising an
alternate array of the second and first color filters;
the fourth color filter group comprising an
alternate array of the fourth and third color filters;
the fifth color filter group being composed in the
same manner as the third color filter group;
the sixth color filter group being composed in the
same manner as the second color filter group;
the seventh color filter group being composed in
the same manner as the first color filter group; and
the eighth color filter group being composed in
the same manner as the fourth color filter group.

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2. An image pickup device according to claim 1, wherein said first to fourth color filters are of yellow, cyan, magenta and green.

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3. An image pickup device comprising an image pickup element for picking up an image of an object, said image pickup comprising:

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a color filter array comprising the color filters arranged in the horizontal and vertical directions, through which the image of the object is picked up by said image pickup element;

plural pixels constituting photoelectric converting elements arranged in the horizontal and vertical directions, respectively corresponding to said color filters;

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a plurality of vertical charge transfer units provided respectively corresponding to the columns of said pixels in the vertical direction, for transferring electric charges from said pixels in the vertical direction;

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a horizontal charge transfer unit connected to the ends of said vertical charge transfer units, for transferring the electric charges, transferred from said vertical charge transfer units, in the horizontal direction; and

an output unit for converting the signal charges transferred from said horizontal charge transfer unit

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into an image signal and outputting said image signal,
wherein said color filter array comprises an
array, in the vertical direction, of a plural units of
color filter groups wherein each unit comprises 8 rows
5 in which an odd-numbered row is composed of an
alternate array of a first color filter and a second
color filter in a predetermined order while an even-
numbered row is composed of an alternate array of a
third color filter and a fourth color filter in a
predetermined order; and

the image signal corresponding to one row, within
the image signal obtained from said image pickup
element in a single image pickup operation, is
outputted as a line-sequential color difference signal
15 of said pixels of 4 rows in the vertical direction.

4. An image pickup device according to claim 3,
wherein:

said color filter at a $(4n+1)$ th row and an odd-
20 numbered column is same as the color filter at a
 $(4n+3)$ th row and an even-numbered column;

said color filter at a $(4n+2)$ th row and an odd-
numbered column is same as the color filter at a
 $(4n+4)$ th row and an even-numbered column;

said color filter at a $(4n+1)$ th row and an even-
25 numbered column is same as the color filter at a

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(4n+3)th row and an odd-numbered column; and
said color filter at a (4n+2)th row and an even-
numbered column is same as the color filter at a
(4n+4)th row and an odd-numbered column;
n being an integer equal to or larger than 0.

5 An image pickup device according to claim 3,
wherein the signal charges of two predetermined pixels
which are mutually adjacent in the vertical direction,
10 among the pixels arranged respectively corresponding to
said color filter, are added and an image signal
corresponding to said added signal charges is outputted
from said output unit.

15 6. An image pickup device according to claim 4,
wherein the signal charges of two predetermined pixels
which are mutually adjacent in the vertical direction,
among the pixels arranged respectively corresponding to
said color filter, are added and an image signal
20 corresponding to said added signal charges is outputted
from said output unit.

25 7. An image pickup device according to claim 5,
wherein said added signal charges of the two pixels are
further added with the signal charges of two
predetermined pixels which are present in the diagonal
direction to the first-mentioned two pixels in a column

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adjacent to that of the first-mentioned two pixels, and an image signal corresponding to the added signal charges of four pixels is outputted from said output unit.

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8. An image pickup device according to claim 6, wherein said added signal charges of the two pixels are further added with the signal charges of two
10 predetermined pixels which are present in the diagonal direction to the first-mentioned two pixels in a column adjacent to that of the first-mentioned two pixels, and an image signal corresponding to the added signal charges of four pixels is outputted from said output unit.

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9. An image pickup device according to claim 7, wherein an image signal corresponding to signal charges is outputted from said output unit by combining a
20 method of adding the signal charges in said vertical direction and in said diagonal direction and a method of further adding, to the signal charges added in said vertical direction, signal charges in said vertical direction.

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10. An image pickup device according to claim 8, wherein an image signal corresponding to said signal charges is outputted from said output unit by combining

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a method of adding the signal charges in said vertical direction and in said diagonal direction and a method of further adding, to the signal charges added in said vertical direction, signal charges in said vertical direction.

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11. An image pickup device according to claim 3, wherein said color filters corresponding to said predetermined two pixels are a combination of cyan and green and a combination of yellow and magenta, or a combination of yellow and green and a combination of cyan and magenta.

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12. An image pickup device according to claim 4, wherein said color filters corresponding to said predetermined two pixels are a combination of cyan and green and a combination of yellow and magenta, or a combination of yellow and green and a combination of cyan and magenta.

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13. An image pickup device according to claim 5, wherein said color filters corresponding to said predetermined two pixels are a combination of cyan and green and a combination of yellow and magenta, or a combination of yellow and green and a combination of cyan and magenta.

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14. An image pickup device according to claim 6,
wherein said color filters corresponding to said
predetermined two pixels are a combination of cyan and
green and a combination of yellow and magenta, or a
5 combination of yellow and green and a combination of
cyan and magenta.

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15. An image pickup device according to claim 7,
wherein said color filters corresponding to said
predetermined two pixels are a combination of cyan and
green and a combination of yellow and magenta, or a
combination of yellow and green and a combination of
cyan and magenta.

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16. An image pickup device according to claim 8,
wherein said color filters corresponding to said
predetermined two pixels are a combination of cyan and
green and a combination of yellow and magenta, or a
combination of yellow and green and a combination of
20 cyan and magenta.

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17. An image pickup device according to claim 9,
wherein said color filters corresponding to said
predetermined two pixels are a combination of cyan and
green and a combination of yellow and magenta, or a
combination of yellow and green and a combination of
cyan and magenta.

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C8 18. An image pickup device according to claim 10,
wherein said color filters corresponding to said
predetermined two pixels are a combination of cyan and
green and a combination of yellow and magenta, or a
5 combination of yellow and green and a combination of
cyan and magenta.

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B8 19. An image pickup device according to claim 3,
wherein said image pickup element further comprises
10 electrodes each of which is connected commonly to every
fourth pixel in the vertical direction, and which are
adapted to control the read-out of the signal charges
from said pixels to said vertical charge transfer units
and to control the transfer of the signal charges from
15 said vertical charge transfer units to said horizontal
charge transfer unit.

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C9 20. An image pickup device according to claim 4,
wherein said image pickup element further comprises
20 electrodes each of which is connected commonly to every
fourth pixel in the vertical direction, and which are
adapted to control the read-out of the signal charges
from said pixels to said vertical charge transfer units
and to control the transfer of the signal charges from
25 said vertical charge transfer units to said horizontal
charge transfer unit.

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21. An image pickup device according to claim 5,
wherein said image pickup element further comprises
electrodes each of which is connected commonly to every
fourth pixel in the vertical direction, and which are
adapted to control the read-out of the signal charges
from said pixels to said vertical charge transfer units
and to control the transfer of the signal charges from
said vertical charge transfer units to said horizontal
charge transfer unit.

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22. An image pickup device according to claim 6,
wherein said image pickup element further comprises
electrodes each of which is connected commonly to every
fourth pixel in the vertical direction, and which are
adapted to control the read-out of the signal charges
from said pixels to said vertical charge transfer units
and to control the transfer of the signal charges from
said vertical charge transfer units to said horizontal
charge transfer unit.

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23. An image pickup device according to claim 7,
wherein said image pickup element further comprises
electrodes each of which is connected commonly to every
fourth pixel in the vertical direction, and which are
adapted to control the read-out of the signal charges
from said pixels to said vertical charge transfer units
and to control the transfer of the signal charges from

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Cend. said vertical charge transfer units to said horizontal
charge transfer unit.

Sub C11 24. An image pickup device according to claim 8,
5 wherein said image pickup element further comprises
electrodes each of which is connected commonly to every
fourth pixel in the vertical direction, and which are
adapted to control the read-out of the signal charges
10 from said pixels to said vertical charge transfer units
and to control the transfer of the signal charges from
said vertical charge transfer units to said horizontal
charge transfer unit.

Sub B11 25. An image pickup device according to claim 9,
15 wherein said image pickup element further comprises
electrodes each of which is connected commonly to every
fourth pixel in the vertical direction, and which are
adapted to control the read-out of the signal charges
from said pixels to said vertical charge transfer units
20 and to control the transfer of the signal charges from
said vertical charge transfer units to said horizontal
charge transfer unit.

Sub C12 26. An image pickup device according to claim 10,
25 wherein said image pickup element further comprises
electrodes each of which is connected commonly to every
fourth pixel in the vertical direction, and which are

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adapted to control the read-out of the signal charges
from said pixels to said vertical charge transfer units
and to control the transfer of the signal charges from
said vertical charge transfer units to said horizontal
charge transfer unit.

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27. An image pickup device according to claim 11,
wherein said image pickup element further comprises
electrodes each of which is connected commonly to every
fourth pixel in the vertical direction, and which are
adapted to control the read-out of the signal charges
from said pixels to said vertical charge transfer units
and to control the transfer of the signal charges from
said vertical charge transfer units to said horizontal
charge transfer unit.

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28. An image pickup device according to claim 12,
wherein said image pickup element further comprises
electrodes each of which is connected commonly to every
fourth pixel in the vertical direction, and which are
adapted to control the read-out of the signal charges
from said pixels to said vertical charge transfer units
and to control the transfer of the signal charges from
said vertical charge transfer units to said horizontal
charge transfer unit.

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Sub B.17 29. An image pickup device according to claim 13,

wherein said image pickup element further comprises electrodes each of which is connected commonly to every fourth pixel in the vertical direction, and which are adapted to control the read-out of the signal charges from said pixels to said vertical charge transfer units and to control the transfer of the signal charges from said vertical charge transfer units to said horizontal charge transfer unit.

10 *sub C13* 30. An image pickup device according to claim 14, wherein said image pickup element further comprises electrodes each of which is connected commonly to every fourth pixel in the vertical direction, and which are adapted to control the read-out of the signal charges from said pixels to said vertical charge transfer units and to control the transfer of the signal charges from said vertical charge transfer units to said horizontal charge transfer unit.

20 *sub C13* 31. An image pickup device according to claim 15, wherein said image pickup element further comprises electrodes each of which is connected commonly to every fourth pixel in the vertical direction, and which are adapted to control the read-out of the signal charges from said pixels to said vertical charge transfer units and to control the transfer of the signal charges from said vertical charge transfer units to said horizontal

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32. An image pickup device according to claim 16,
wherein said image pickup element further comprises
5 electrodes each of which is connected commonly to every
fourth pixel in the vertical direction, and which are
adapted to control the read-out of the signal charges
from said pixels to said vertical charge transfer units
and to control the transfer of the signal charges from
10 said vertical charge transfer units to said horizontal
charge transfer unit.

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33. An image pickup device according to claim 17,
wherein said image pickup element further comprises
15 electrodes each of which is connected commonly to every
fourth pixel in the vertical direction, and which are
adapted to control the read-out of the signal charges
from said pixels to said vertical charge transfer units
and to control the transfer of the signal charges from
20 said vertical charge transfer units to said horizontal
charge transfer unit.

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34. An image pickup device according to claim 18,
wherein said image pickup element further comprises
25 electrodes each of which is connected commonly to every
fourth pixel in the vertical direction, and which are
adapted to control the read-out of the signal charges

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from said pixels to said vertical charge transfer units
and to control the transfer of the signal charges from
said vertical charge transfer units to said horizontal
charge transfer unit.

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